

PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q90773

Gopal RAMACHANDRAN, et al.

Appln. No.: 10/752,955

Group Art Unit: 2851

Confirmation No.: 4429

Examiner: Andrew T. SEVER

Filed: January 7, 2004

For: IMAGE PROJECTION SYSTEM AND METHOD

SUBMISSION OF EXECUTED DECLARATION UNDER 37 C.F.R. §1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith is a copy of an executed Declaration Under 37 C.F.R. §1.132 signed
by Gopal RAMACHANDRAN.

Respectfully submitted,



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WASHINGTON OFFICE

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**In re Patent Application of:****Gopal Ramachandran****Serial No. 10/752,955****Filing Date: January 7, 2004****For: Image Projection System and Method****Examiner: Andrew Sever****Group Art Unit: 2851****Attorney Docket No. Q90773**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION OF GOPAL RAMACHANDRAN
UNDER 37 CFR § 1.132

I, Gopal Ramachandran, do hereby declare and say as follows:

1. I am a resident of California residing at 22900 Congress Springs Rd, Saratoga CA 95070 USA and have been working on graphics and image processing semiconductor devices since 1985, and their application to consumer electronics systems including projection systems and RPTV designs since 1996. I graduated with a Masters of Science in Electrical Engineering in 1970. I have worked over 6 years for my current employer Silicon Optix Inc, and spent most of that time working on projection systems and RPTV designs.

2. My career since 1996 has been involved with various aspects of image processing, and since 2001, I have concentrated on how digital image processing can help alleviate artifacts produced by front and rear projection system components including, inter alia, the illumination sub-system, the micro-display device or devices, associated prisms, the projection lens assembly, the reflection assembly, and the

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screen structure. I have been the inventor of several patents and a lecturer in many major consumer electronics conferences including the following:

- CES 2003 Las Vegas NV Jan 7th 2003 working thin chassis RPTV prototype shown
- BA-SID Chapter Cupertino CA Feb 20th 2003 presentation
- Projection Summit 2003 Las Vegas NV – June 20th 2003 presentation
- CES 2005 Las Vegas NV Jan 7th 2005- thin-chassis RPTV demo shown by customer
- SID 2005 Boston MA- thin-chassis demo using emulation of geometry processor
- CES 2007 Las Vegas NV Jan 7th 2007 working thin-chassis geometry processor demo
- Display Summit 2007 Beijing China – April 24th 2007 presentation
- SID 2007 Long Beach CA- May 2nd 2007 presentation and conference paper
- Display Search Conference San Diego CA- June 15th 2007 presentation
- Projection Summit 2007, Anaheim CA- June 18th 2007 presentation
- CEDIA 2007, Denver CO- geometry processor demo
- SID DAC San Francisco CA Oct 24th 2007- invited presentation

3. I have witnessed that one commercially very important goal in an RPTV design is to achieve a thin cabinet or housing depth compared with the screen diagonal. Prior solutions have achieved typical 3-to-1 ratio of diagonal to depth (D-to-d ratio). I have

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been an inventor of patents and patent applications regarding projection systems and RPTV with the goal of making the D-to-d of an RPTV much better (larger) than 3-to-1.

4. I am a member of SID (Society for Information Display) and SPIE (International Society for Optical Engineering).

5. I have authored papers for publication by SPIE and SID related to image processing and projection displays. I have also made presentations at various industry conferences on projection systems, and display systems. In addition I have authored papers on video DSP chips and signal processing for publications like Electronics, Electronic Design, etc.

6. I have participated in the fabrication of the sxW2-300 Geometry Processor by Silicon Optix Inc. at a cost of several million USD. I have also participated in the complete optical and opto-mechanical design for a 65" diagonal, 6.5" thick rear projection TV using 3 1920x1080 LCOS panels, 3 R,G,B solid-state lasers, a 9-element projection lens and 2 curved mirrors.

7. I have read the Office Action mailed on 06/06/2007 for the above referenced application and the patent publication US-2002/0075459 to Lin (hereinafter referred to as "Lin"), US patent US-6,520,647 to Raskar (hereinafter referred to as "Raskar"), and US patent 5,274,406 to Tejima (hereinafter referred to as "Tejima"), cited by the Examiner in rejecting Claims 1 and 21 of the Subject Application as previously presented. Based on my review of the cited references, known prior art, and my claimed invention, the following comments are presented.

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8. I submit that Lin teaches mechanical adjustment of a projector via a positioning bracket until the reflection of the image off a seemingly flat mirror is sharp (Lin Paragraph 13 and Figures 1 and 2); and that Lin's projection system is a simple on-axis projection system in a box which uses "a lid for dust protection and esthetic appearance" (Lin Paragraph 14); and that Lin does not address the optimization of the D-to-d ratio. As such, Lin's system projects an image which does not seem to suffer any distortion (or Lin does not mind any distortion or correction thereof) and even the projector could be taken out the housing and used in a totally different mode (Lin Paragraph 14).

9. I submit that Raskar, on the other hand, teaches a method for automatically correcting keystone in a front projection system using sensors such as a laser sensor, magnetic sensor or a gyro sensor (Raskar Column 2 lines 48-65), and that, as such, Raskar's teachings are related to purely geometric distortion related to the relative position and orientation of a projector and the projection screen, and that Raskar does not even address optical distortions and therefore does not teach or suggest correction for distortions caused by a lens system or an optical reflection assembly with a curved mirror.

10. I submit that Tejima, in column 7, lines 38-43, states that "a curved surface in the reflecting mirror degrades the image and therefore a Fresnel form of mirror implementation is required in order to keep the mirror surface planar", that Tejima further states in Column 3, lines 13-17 that "For reference, design values and performance, when a so-called ideal lens, which does not cause aberration is employed are given below", and that these statements, along with other facts stated in Tejima, are indications of anomalies and distortions caused in a projected and reflected image. I

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note that Tejima acknowledges the difficulties of making a thin-housing RPTV using off-axis projection since in Column 4, lines 29-35 Tejima states that "Although the mechanical configuration can be made thinner if the angle between the screen 40 and the reflecting surface 30 is made smaller, the image distortion as projected on the screen 40 will be large as shown in Fig 7B with the result that the system cannot withstand practical use". I further note that Tejima's distortion plots (Fig 13D) still show visible distortion even with the use of an "ideal lens" and this distortion plots would not be acceptable by today's consumers.

11. I submit that the subject matter of the Subject Application overcomes all of the difficulties mentioned in Lin, Raskar and Tejima as well as difficulties associated even with real-world lens and curved mirrors, and that the inventiveness of the claimed invention, as set forth in Claims 1 and 21 of the Subject Application, is in using in combination, inter alia, a light engine and a curved mirror in conjunction with electronic warping for distortion correction; and that such electronic distortion correction includes correcting for the image distortions and anomalies caused in the light engine and the reflection assembly themselves. I note that this is clearly stated in Claims 1 and 21 of the Subject Application where it reads: "wherein, the electronic warping is performed such that in the projected image on the display surface, optical and geometric distortions, including distortions caused in the light engine and the optical reflection assembly, are substantially eliminated."

12. I further submit that that neither Lin, nor Raskar, nor Tejima, nor any combination thereof, addresses electronic warping for distortion correction in the presence of a curved mirror; and that no combination of Lin, Raskar, and Tejima could have been envisioned by a person of ordinary skill in the art, at the time of filing of the Subject

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Application, to achieve a commercially desirable RPTV that can be achieved according to the subject matter claimed in Claims 1 and 21 of the Subject Application.

13. I further submit that the subject matter of the claimed invention, as set forth by Claims 1 and 21 of the Subject Application, achieves a commercially desirable RPTV solution that would not have been inferred from any combination of Lin, Raskar, and Tejima by a person of ordinary skill in the art at the time the filing of the Subject Application; and that the subject matter of Claims 1 and 21 of the Subject Application presents a unique combination of elements, including inter alia, a light engine, a reflection assembly with at least one curved mirror, and electronic warping for image distortion correction, including image distortions caused in the light engine and the reflection assembly, all of which are necessary to achieve a commercially viable RPTV with a desirable D-to-d ratio according to the teachings of the Subject Application.

14. I therefore submit that the claimed invention is truly set forth by independent Claims 1 and 21 of the Subject Application, and is truly novel and patentable.

15. I hereby solemnly declare that all statements made herein of my own accord are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of the application or any patent issued thereon.

11-1-07
Date

Gopal Ramachandran
GOPAL RAMACHANDRAN